MEMORANDUM

DATE: January ~~19~~??, 2016

SUBJECT: **Action Memorandum: Removal Action, Southern Nevada Water Authority Dewatering Project, Nevada Environmental Response Trust Site, Clark County, Nevada (NDEP No.: H-000539)**

FROM: Carlton Parker, Supervisor, BISC, NDEP

TO: James (JD) Dotchin, Bureau Chief, BISC, NDEP

I. PURPOSE

The purpose of this memorandum is to document approval of the removal action for the shallow groundwater in the area of Pabco Road and the Las Vegas Wash originating from the Nevada Environmental Response Trust (NERT) site, located outside of the City of Henderson, Clark County, Nevada, as defined in the NERT Settlement Agreement ("Henderson Property"):

1. Strong base anion (SBA) ion exchange treatment of perchlorate impacted groundwater dewatered during completion by the Southern Nevada Water Authority (SNWA) of the Sunrise Mountain and Historic Lateral weir projects in the Las Vegas Wash.

II. SITE CONDITIONS AND BACKGROUND

Project Background. SNWA developed the Las Vegas Wash Stabilization Program to protect wetlands, reduce erosion, intercept contamination, minimize sediment transport to Lake Mead, create recreation opportunities, and restore habitat. To date, SNWA has constructed ten permanent grade stabilization weirs within the Clark County Wetlands Park. SNWA will construct three additional weirs within the Clark County Wetlands Park as part of this stabilization program—the Tropicana Weir, the Sunrise Mountain Weir and the Historic Lateral Weir. Two of these three weirs are located within the downgradient perchlorate-impacted groundwater plume from the Henderson Property. The weir construction requires surface water diversion of the Las Vegas Wash and groundwater dewatering within the construction site. The groundwater extracted during the dewatering project is projected to contain approximately three tons of perchlorate. Direct discharge of the groundwater from the dewatering project into the Las Vegas Wash without treatment would substantially contribute to the continued exceedance of the current Nevada provisional maximum contaminant level ("Provisional MCL") for perchlorate. On April 12, 2016, the Nevada Division of Environmental Protection (NDEP) issued NERT an Order Requiring Engineering Evaluation/Cost Analysis to address and treat the impacted groundwater associated with the SNWA dewatering project for the Sunrise Mountain Weir and the Historic Lateral Weir.

A. Site Description

1. Removal Site Evaluation

NDEP has previously investigated potential source areas to characterize any soil and/or groundwater impacts. Historic investigations focused on hexavalent chromium and perchlorate in groundwater.

The historic investigations prompted the removal action and construction of a groundwater treatment system for the removal of hexavalent chromium with following investigations prompting the construction of an additional groundwater treatment system (FBR system) for the removal of perchlorate. The Phase B Investigation prompted the excavation of over 900,000 cubic yards of impacted soils and tailings as well as the removal of the on-site Hazardous Waste Landfill.

Please see Appendix B: B1- Figure 1 for an overview of the locations of the proposed Sunrise Mountain and Historic Lateral weirs as well as the Henderson Property boundary, and the approximate location of the downgradient perchlorate plume which are the subject of this Action Memorandum.

The available water quality data associated with dewatering at the Sunrise Mountain and Historic Lateral weirs indicate that the average perchlorate concentrations at 5,000 gallons per minute (gpm) flow are 1.3 parts per million (ppm). Please see Appendix B: B6 Dewatering Water Quality Criteria for detailed water quality information associated with the Sunrise Mountain and Historic Lateral weirs, which are the basis of design for this project. Direct discharge of the groundwater from the dewatering project into the Las Vegas Wash without treatment would substantially contribute to the continued exceedance of the current Nevada Provisional MCL for perchlorate.

2. Physical Location

The Henderson Property (NDEP #: H-000539) is approximately 346 acres and is located approximately 13 miles southeast of the City of Las Vegas in an unincorporated area of Clark County, Nevada in Township 22 S, Range 62 E, Sections 1,12, and 13. This site is located within the Black Mountain Industrial (BMI) complex, which is surrounded by the City of Henderson, Nevada. The population of Henderson, NV is approximately 270,000 with the area immediately surrounding the site being industrial and commercial with some nearby residences. The dissolved perchlorate plume originating from the Henderson Property is impacting the Las Vegas Wash, which is located approximately 3.5 miles to the north of the Henderson Property. The Las Vegas Wash is a tributary to Lake Mead and the Colorado River system, which affects approximately 15 to 20 Million end water users in Nevada, Arizona, and California.

The proposed Sunrise Mountain and Historic Lateral weir construction locations are located approximately 2,000 feet west and 3,000 feet east of Pabco Road, respectively as shown in Appendix B: B2- Figure 2. The SNWA construction areas and easements associated with the weir construction include approximately 75 and 45 acres respectively for the Sunrise Mountain and Historic Lateral weirs. The Henderson Property is located approximately 3 miles southwest of the proposed Sunrise Mountain and Historic Lateral weirs.

3. Site Characteristics

The proposed Sunrise Mountain and Historic Lateral weirs are located in the Las Vegas Wash north (downgradient) of the Henderson Property. Land ownership in and around the proposed weir locations is shown on Appendix B: B4- Figure 4. Land use in the area currently consists of park areas and other undeveloped lands.

4. Release or Threatened Release Into the Environment of a Hazardous Substance, or Pollutant or Contaminant

For purposes of this removal action, the following contaminants have been observed in groundwater at concentrations above the Nevada drinking water Provisional MCL:

- Perchlorate

5. NPL Status

This site is not listed on the National Priorities List.

6. Maps, Pictures and Other Graphic Representations

The following Maps, Charts and Figures are found in Appendix B of this document.

B1. "Las Vegas Weir Locations Overview Site Map" – Figure 1 from Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B2. "Las Vegas Wash Weir Locations Site Location Map" – Figure 2 from Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B3. "Las Vegas Wash Weir Locations Monitoring Well and Plume Location Map" – Figure 3 from Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B4. "Las Vegas Wash Weir Locations Land Ownership and Permitting Jurisdiction" – Figure 4 from Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B5. "Las Vegas Wash Weir Locations Conceptual Treatment Facility Location and Conveyance" – Figure 5 from Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B6. "Basis of Design Data Dewatering Water Quality Criteria Sunrise Mountain and Historic Lateral Weirs" –Engineering Evaluation/Cost Analysis Weir Dewatering Treatment (2016, Tetra Tech)

B. Other Actions

1. Previous Actions

SNWA previously constructed ten permanent grade stabilization weirs within the Clark County Wetlands Park to protect wetlands, reduce erosion, intercept contamination, minimize sediment transport to Lake Mead, create recreation opportunities, and restore habitat.

2. Current Actions

Continuously since 2004, perchlorate has been removed from the Henderson Property via biological reduction in fluidized bed reactors from groundwater collected from the On-Site (Interceptor), Athens, and Seep Well Fields.

C. State and Local Authorities' Roles

NDEP is the lead government agency with respect to the Henderson Property, and all previous and current actions have been or are being completed with NDEP oversight. The actions contemplated within this Action Memorandum will also be overseen by the United States Environmental Protection Agency.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Construction of the Sunrise Mountain and Historic Lateral weirs will require Las Vegas Wash diversion and construction dewatering. Based on available information, current estimates by NDEP and SNWA indicate that the groundwater extracted during construction dewatering will contain approximately three tons of perchlorate. Direct discharge of the groundwater into the Las Vegas Wash without treatment would substantially contribute to continued exceedance of the current Nevada Provisional MCL for perchlorate of 18 parts per billion within the Las Vegas Wash. The Las Vegas Wash is a tributary to Lake Mead, the primary

drinking water source for the Las Vegas Valley, and the Colorado River, which is a significant source of drinking water for populations in Arizona and Southern California. Any increase in perchlorate loading to the Las Vegas Wash could threaten these drinking water sources.

B. Threats to the Environment

Any increase in perchlorate loading to the Las Vegas Wash could threaten Lake Mead and the Colorado River.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of pollutants and contaminants from this dewatering project, if not addressed by implementing the removal action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. SELECTED ACTIONS AND ESTIMATED COSTS

A. Selected Actions

1. Selected Action Description

SBA ion exchange treatment is a proven commercialized technology that removes perchlorate from impacted water. It is a physicochemical process where one or more contaminants are held electrostatically on the surface of a solid and are exchanged for ions of similar charge in a solution. Ion exchange materials typically consist of resins. For perchlorate treatment, resins are attached with ions such as chlorides and hydroxides which replace the perchlorate ion in the contaminated water.

A SBA ion exchange treatment process will be implemented to treat the extracted groundwater from the dewatering project. The maximum flow capacity of the exchange system will be 6,900 gpm. The SBA ion exchange treatment process will consist of the following: (1) a pump station at each weir construction hand-off point where contaminated groundwater will be received in storage tanks and transfer pumps will convey the water through either above ground or underground piping to a single treatment plant; (2) pretreatment using multi-media filtration to remove suspended solids from the water before treatment for perchlorate; (3) SBA ion exchange treatment of the water to remove perchlorate; (4) suspended solids management; and (5) temporary storage of treated water followed by discharge to the Las Vegas Wash.

The suspended solids will be managed in one of two ways: (1) on-site, the suspended solids will be backwashed from multi-media filters and the backwashed solids will be contained in storage tanks, and re-blended with the treated effluent prior to the effluent being conveyed to the Las Vegas Wash;

or (2) off-site, the suspended solids will be backwashed from multi-media filters, the backwashed solids will be contained in storage tanks, the solids will be initially separated from liquids in a clarifier, the thickened sludge will be transferred to holding tanks and a centrifuge will then be used to dewater the sludge. The dewatered cake will be transported off-site for disposal.[1]

A single plant location was selected to minimize both costs and disturbance area along the Las Vegas Wash. The alternative evaluated was for one plant at each weir location which would have increased both capital and operation and maintenance costs. NDEP previously removed this option from consideration. The location of the single plant was selected to be co-located with the existing NERT Lift Station #1. One pump station will be placed at each proposed weir—Sunrise Mountain and Historic Lateral—to deliver the groundwater to the treatment plant. Aboveground or underground piping from the two weirs will deliver the water from the pump stations to the centralized plant.

Both SBA ion exchange and biological treatment were considered as alternatives for the treatment plant. SBA ion exchange was ultimately selected as the treatment method for the following reasons:

(1) SBA ion exchange is a proven technology to treat varying influent flow rates including zero flow, a scenario which is likely in this instance based on historic weir construction practices. The bacteria in the biological plant would not survive periods of zero or no flow conditions without the ability to enter recirculation mode which would require a ten (10) million gallon equalization tank or pond. Ten (10) million gallons is approximately one operating day for both weirs dewatering simultaneously, again a likely scenario given historic weir construction practices.

(2) SBA ion exchange is able to treat perchlorate concentrations over a large range (ranging from 0.05 parts per million (ppm) to 500 ppm). A biological treatment plant does not operate effectively when influent concentrations fluctuate and the biological plant becomes less cost effective at lower concentrations. Influent concentrations for this project are expected to be below 1.8 ppm.

(3) Construction of an SBA ion exchange plant requires considerably less time to construct when compared to a biological plant. Construction must be completed and the plant must be ready to receive water by August 1, 2017. There is not sufficient time to construct a biological treatment plant.

(4) The capital costs associated with constructing a SBA ion exchange plant were evaluated to be 50% less expensive than the costs for constructing a biological treatment plant.

[1] **Note**: to be updated depending on whether on-site or off-site solids management will be implemented.

(5) The footprint of the SBA ion exchange plant is fairly compact when compared to the biological treatment plant and the associated equalization tank(s), pond(s) and ancillary equipment. Basic Environmental Company (BEC) will provide limited temporary access that does not include space for large tanks or ponds. Additionally, the smaller the footprint of the plant the more visually acceptable the plant will be in this area near the Clark County Pabco Trailhead Park and nature trails.

(6) There is a lower risk of exceeding Secondary Standards (visual and odor) when using the SBA ion exchange system.

When considering the capacity of the SBA ion exchange system two options were considered: a 5,000 gpm maximum option and a 6,900 gpm maximum option. A system capacity of 6,900 gpm rather than a capacity of 5,000 gpm was selected for the following reasons:

(1) In consultation with SNWA, NDEP compared the Sunrise Mountain Weir and the Historic Lateral Weir dewatering rates to the previous neighboring weir dewatering projects. The Sunrise Mountain Weir will be installed downstream of SNWA's Upper Narrows Weir which had a maximum daily average flow rate of 2,453 gpm (the instantaneous peak flow rate was not recorded or observed). Historic Lateral Weir will be installed upstream of SNWA's Bostic Weir which had a maximum daily average flow rate of 3,992 gpm. The proposed Sunrise Mountain and Historic Lateral Weirs will be constructed in similar locations along the Las Vegas Wash, and therefore the combined maximum daily average flow rate could be as high as 6,445 gpm if both weirs are dewatered at the same time which has been the historic weir construction practice.

(2) Backwaters (pooling) is a concern when constructing in close proximity to existing weirs. This can cause surface water beyond the immediate construction area to pool and rise which can cause flooding and require greater pumping flow rates. This has been observed at previous weir construction projects, namely the SNWA's Upper Narrows Weir.

(3) Storm events could require increases in dewatering flow rates where surface waters enter the dewatering excavation(s). The C-1 Flood Channel (which can flow at 67,324 gpm in an "average" storm event) enters the Las Vegas Wash in the middle of the Historic Lateral Weir project. The higher flow rate will also allow additional capacity in storm events.

(4) Lower dewatering flow rates would extend the duration of the weir construction project(s), increasing the likelihood of a major storm event. This in turn increases the risk of physical damage and delay to the project

in the event of a major storm event, increasing overall weir project costs and water treatment costs.

(5) The additional incremental cost of a 6,900 gpm option is estimated to be $3,900,000. Nearly all of the estimated additional cost is expected to be associated with the operation and maintenance of the system. 64% of the operation and maintenance cost is connected to the resin change out and disposal. Therefore, if required flows remain below 5,000 gpm, the project will not incur most of the additional potential cost. However, if required flows are above 5,000 gpm, all of the risks listed above are likely to increase the costs to above the incremental additional capital costs associated with the 6,900 gpm option.

2. Contribution to Remedial Performance

While the final remedy has not been selected for this site, this groundwater removal action will, at a minimum, greatly contribute to the long-term effectiveness of the final remedy selected.

3. Description of Alternative Technologies

Biological treatment was also considered in selecting a response action to address the perchlorate contamination from the SNWA's dewatering project. Biological treatment of perchlorate is a proven commercialized technology that uses bacterial cultures to anoxically degrade perchlorate to chloride. Under favorable conditions, the denitrifying anaerobes can reduce perchlorate to chloride, water and carbon dioxide.

Ultimately, biological treatment was not selected as the technology is not feasible under these specific project conditions. Biological treatment was not an effective technology for this action due to the anticipated fluctuations in the water flow rates which will range from 0 to 6,900 gpm. In order to maintain biological treatment, consistent water flow is required. The minimum required flow for biological treatment is not present in this project.

4. Engineering Evaluation/Cost Analysis (EE/CA)

Please see Appendix A for the Engineering Evaluation/Cost Analysis (EE/CA) prepared by Tetra Tech in August 2016.

The EE/CA was released for the required 30 day public comment period. No public comments were received on the EE/CA.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

Federal ARARs determined to be practicable for this site are as follows:

- Safe Drinking Water Act (SDWA)

- National Environmental Policy Act (NEPA)
- Clean Water Act (CWA)
- National Historical Preservation Act (NHPA)
- Endangered Species Act (ESA)
- Resource Conservation and Recovery Act (RCRA)
- Spill Prevention Control and Countermeasures Regulation (SPCC)
- Right-of-Way for Pipelines

State and local ARARs determined to be practicable for this site are as follows:

State:

- NAC 445A.2156 - 2158 (Las Vegas Wash Beneficial Use Standards for Confluence of Las Vegas Wash with Lake Mead to Telephone Line Road).
- NAC 459.970 – 9729 (Certification of Certain Consultants and Contractors)
- NAC 445A.228 – 263 (Discharge Permits)
- NRS 533.437 – 4377 (Groundwater Appropriations – Environmental Permits)
- NAC 503.005 et seq. (Classification and Taking of Wildlife)
- NAC 527 et seq. (Protection and Preservation of Timbered Lands, Trees, and Flora)

Local:

- City of Henderson Air Permit
- City of Henderson Site Plan Review
- City of Henderson Building Permit
- City of Henderson Grading Permit
- City of Henderson Dust Control Permit
- Construction Stormwater Permit
- City of Henderson Traffic Control Plan
- Clark County Land Use and Zoning Review
- Clark County Building Permit
- Clark County Grading Permit
- Clark County Dust Control Permit
- Clark County Flammable/Combustible Liquid Storage

6. Project Schedule

Construction of the SNWA weirs is anticipated to begin in June 2017. As such, NERT has been directed to complete the dewatering treatment system

construction by July 2017 and to complete system commissioning in July 2017. The treatment system will be ready to receive and treat water by August 1, 2017.

B. Estimated Costs

Please see Appendix A: the Engineering Evaluation/Cost Analysis (EE/CA) prepared by Tetra Tech in August 2016 for a detailed breakdown of the estimated costs for the action.[2]

VI. EXPECTED CHANGE IN THE SITUATION IF ACTION HAD BEEN DELAYED OR NOT TAKEN

Direct discharge of the groundwater from the dewatering project into the Las Vegas Wash without treatment would potentially add approximately three tons of perchlorate to the Las Vegas Wash and substantially contribute to the continued exceedance of the current Nevada Provisional MCL for perchlorate. Perchlorate concentrations in the Colorado River and Lake Mead, significant drinking water sources, may have been impacted at greater than existing ARARs.

VII. OUTSTANDING POLICY ISSUES

EPA promulgation of a perchlorate MCL: the timing and value of a perchlorate MCL is unknown at the finalization of this Action Memorandum, but this is not expected to be before December 2019.

VIII. ENFORCEMENT

The potentially responsible parties (PRPs) have been identified for this site. At the time of finalization of this action memorandum the PRPs are the Nevada Environmental Response Trust (NERT) and the Department of Defense (perchlorate contamination only). Reorganized Tronox's obligations for legacy liabilities were discharged through Tronox Inc.'s bankruptcy, effective February 14, 2011.

IX. RECOMMENDATION

This memorandum documents NDEP's decision to compel the above-described groundwater removal action for the Henderson Property, in Clark County, Nevada, developed in accordance with CERCLA as amended, and consistent with the NCP. This decision is based on the administrative record for the site located in the NDEP-Las Vegas Office.

Groundwater conditions at the site meet the NCP section 300.415(b)(2) criteria for removal and I recommend approval of the removal action that has been and is currently being implemented as described in this action memorandum.

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[2] **Note**: to be updated with specific figures depending on whether on-site or off-site solids management will be implemented.

☐ **Approval** ☐ **Disapproval**

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James (JD) Dotchin Date
Bureau of Industrial Site Cleanup
Nevada Division of Environmental Protection